

MAKING THE LEAN MANUFACTURING SUPPLY CHAIN LEAP ACROSS SMALL AND MEDIUM SCALE INDUSTRIES (SMIs) IN MALAYSIA

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ABSTRACT

The aim of this paper is to present a framework mainly focussing on lean supply chains suitable for the operation of SMIs in Malaysia. This model shall present the strategies to instill supplier capabilities and the supporting activities in creating a lean supply chain across multiple tiers. This paper uses a case study to illustrate its findings based on a medium scale industry in Malaysia. Further empirical research is needed to formulate a research framework that could be used as a generic model for SMIs. The framework is tested and tentative implications are summarized.

Keywords: framework, lean supply chain, multiple tiers

INTRODUCTION

In the advent of this new millennium, western companies face three major challenges- to double the productivity of their own operations, to help their lower tiers or suppliers to double theirs as well, and together to achieve further substantial gains through integrating all the steps down the whole *value supply and distribution chain* from the raw material to end customer. Firms that achieve all three will grow and prosper - those who do not may then find them in hard positions to attain their competitiveness to survive in the marketplace.

The effective executions of supply chain management strategies require the alignment of both internal and external stakeholders. Alignment is highly sought-after the goal attainment, but one which is rarely achieved in western businesses (Mikami, 1982). This is due to a number of factors such as (Emiliani, 2000):

- i) the temporal nature of business relationships,
- ii) management turnover, inconsistent or confusing direction from senior management,
- iii) poor morale, and
- iv) systemic layoffs.

If internal alignment can not be achieved, then how can external alignment with even first tier suppliers be further achieved? Further to above argument, many large scale manufacturing companies today managed in the western tradition seek to obtain alignment with their suppliers' tiers by engaging them in activities to improve their production capabilities (Handfield *et al.*, 2000). **Most of the Suppliers are SMIs.** Companies considered as leaders in lean production have long realized that entire supply chains (or supply networks), not just first tier suppliers, must mirror their production

practices in order for lean systems to function properly (Womack-*et al.*, 1990; Ohno, 1988). Realizing the importance of lean operations in SMIs for the competitive health of today's industry, this paper will therefore present the initiative, strategic and tactics that shall be adopted by SMIs to bring about the desired accomplishment. Recommendations are given to help them in their quest to strengthen the role that they shall play to develop a lean supply chain. To be a **lean supplier** to larger scale enterprises or manufacturers, they ought to be a **lean producer**. Thus, to adopt lean operations as their system of production as well as to demonstrate the importance of understanding the perspective of multiple stakeholders (include customers and suppliers), all the lean attributes, which are made more relevant for SMIs are linked into a holistic framework for the compilation of a generic model.

DIFFUSION OF LEAN THINKING THROUGH THE SUPPLY CHAIN- Creation of Lean Suppliers

What is the current orthodoxy in supply chain management thinking? In very general terms it can be described as (Cox, 1997):

... a way of thinking that is devoted to discovering tools and techniques that provide for increased operational effectiveness and efficiency throughout the delivery channels that must be created internally and externally to support and supply existing corporate product and service offerings to customers.

This way of thinking has its lineage in the work that was originally undertaken to understand the phenomenal success of Japanese industry in the 1970s and 1980s, primarily in the automotive sector (Womack *et al.*, 1990). Indeed, it can be argued that a great deal of supply chain management practice today appears to be nothing more than an attempt to replicate, in a variety of product and service supply chains, the approach to external resource management originally pioneered by Toyota. Given this, it is perhaps worth outlining in summary form what the lean paradigm is. There appear to be eight defining characteristics of the lean approach:

1. Strive for perfection in delivering value to customers.
2. Only produce what is pulled from the customer just-in-time and concentrate only on those actions that create value flow.
3. Focus on the elimination of waste in all operational processes, internally and externally, that arise from overproduction, waiting, transportation, inappropriate processing, defects and unnecessary inventory and motion.

4. *Recognize that all participants in the supply chain are stakeholders and that we must add value for everyone in the business.*
5. *Develop close, collaborative, reciprocal and trusting (win-win), rather than arms-length and adversarial (win-lose), relationships with suppliers.*
6. *Work with suppliers to create a lean and demand-driven logistics process.*
7. *Reduce the number of suppliers and work more intensively with those given a preferred long-term relationship.*
8. *Create a network of suppliers to build common understanding and learning about waste reduction and operational efficiency in the delivery of existing products and services.*

In outlining these characteristics it is obvious that a great deal of supply chain thinking is based either on copying from, or adapting, the basic insights that have been gleaned from the way in which Toyota has historically managed itself and its relationships with customers and suppliers. Whilst, the business success will be derived from companies managing to enhance the total performance of the supply chain, so that it can deliver improved value to customers. Companies are, therefore, instructed to construct ever more efficient and responsive supply chains because it will no longer be company competing with company, but supply chain competing against supply chain. In addition, to create lean suppliers to attain competitive advantage for the value chain, the main touchstone is to instill supplier capabilities in lean production across multiple tiers. To achieve this, the following methodology is thus recommended:

Supplier Development Strategy - Long Term & Trustworthy

Since most businesses are small, higher tier buyers seeking to create lean suppliers must inevitably interact with lower tier suppliers. The interaction will be productive if the buyer first asks for feedback from suppliers and makes commitments to resolve systemic problems prior to requiring the adoption of lean production practices. This is a very effective starting point, as it can help the buyer fix or eliminate wasteful business practices and also gain supplier buy-in for transitioning to lean production.

Whilst, a tactical supply management program in conjunction to the lean practices across SMIs shall be implemented to ensure that the buying groups-and their suppliers will be ready for full-scale lean manufacturing programs in the near future. The main touchstone of this agenda shall therefore emphasize:

- 1) **Supplier development** programs through lean promotion team, in-house training, seminar, notes distribution via e-mail and etc, which stress continuous improvement in all areas-quality, cost, delivery and after-sales support.
- 2) **Strategic sourcing and supply base integration** through long term agreements that cover the life of the end product.
- 3) **Subcontract management** techniques that push supplier development past the first tier to second and third-tier suppliers.

The supplier development strategy is usually built from the following viewpoint: the benefits of local supply networks greatly outweigh the disadvantages (Porter, 1998) and that opportunities can only be understood through extensive personal interaction with suppliers - i.e. the owner and his or her management team. This included three key components:

- 1) *understanding which business practices or procedures make it difficult for suppliers to meet their customers' expectations;*
- 2) *making commitments to resolve systemic problems; and*
- 3) *evaluating suppliers' operations and recommending areas for improvement.*

The focus is to improve the sub tier suppliers' operations by helping them understand and implement the fundamentals of lean production which include 5S, total productive maintenance, set-up reduction, mistake-proofing, visual factory, standard work, and cellular production of part families.

Whilst, the cost, delivery, and quality improvements obtained by implementing lean production would eliminate overseas sourcing from consideration. And this goal has to be made explicit so that trust and collaboration of the local suppliers' network can be established. In this context, the customer/buyer seeks the supplier as an extension of his own plant and offers long term business contract for guaranteed short lead time, prompt and regular deliveries and zero defects. With this arrangement, the dedication and commitment of suppliers will then be further reinforced into the era of leanness - emphasis cost reduction with improved added value.

On the other hand, since the supplier is regarded as part of the 'team', then as part of the supplier development program, they should be involved with all the major company activities both on a social and professional basis. The customer will visit the supplier regularly offering advice and, in some cases, financial or manpower assistance. Similarly the supplier is often expected to early involve in all pre-production product development as shown in Figure 1.

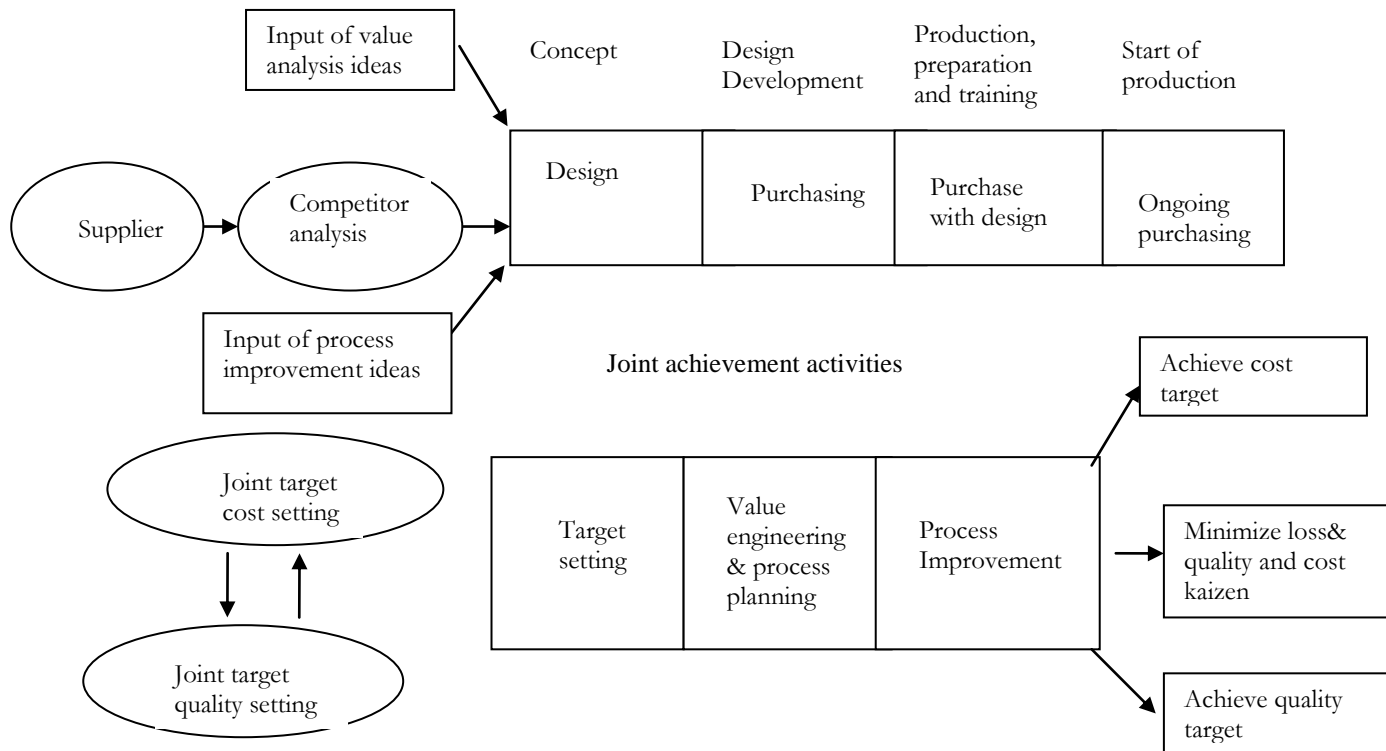


Figure 1: A Generic Model Showing the Early Involvement of Suppliers In The New Product Development Process

RESEARCH METHODOLOGY

Generative strategy and case study research procedures are more meaningful when conducting industrial management research. The generative strategy here implies to qualitative methods. The empirical part of this research follows a multiple case study approach within a generative research strategy. Using gap analysis framework, conducting interviews and gathering information from questionnaires are among the data collection methods used. This research is based on findings from a medium scale industry in Malaysia, which is working on improving quality and maintenance. However, this paper focuses mainly in the supply chain system. A framework for Lean Supply System is developed and from here, another framework for Lean Manufacturing System is formulated for the basis for varieties of SMIs.

ANALYSIS OF RESULTS

FROM CONCEPT TO ACTION : A LEAN LEAP IN SMIs

1) Focused Supplier Networks: Single Sourcing & Lean Purchasing

In Japan, one of the most critical aspects of the lean/JIT philosophy is the idea of focused supplier system. This network is based on a hard core of dedicated suppliers which produce a limited quantity of products but whose major output is dedicated towards the one customer (Hines, 1994). Hence, the majority of large Japanese manufacturers have a very few suppliers when

compared to comparable western firms and this is enhanced by the general rationalization parts used by the manufacturer.

This makes the whole system easier to control. Of course, the idea of mutual trust is central. The customer will be highly dependent upon the ability of the supplier to deliver the *right product, at the right time, at the right place with the right sequence and of good quality*. Similarly, the supplier concentrates its soles output on the one customer. Many firms within the west are now realizing that there is more to be gained by working with suppliers. Single sourcing is perhaps over-optimistic within western IR climates. Dual sourcing may sometimes be the key, with the compromise between the strike security and the ability to develop close ties with selected suppliers. For example, many of the major automotive companies such as Austin Rover, Jaguar and Ford are nowadays well on the way towards a resolved buyer-supplier status largely as a result of the 'preferred supplier schemes' which they now run in order to reduce the supplier base.

Suppliers are rated using vendor rating schemes which help identify those suppliers with the potential for a close relationship and to highlight problem areas which may be resolved by mutual effort. Through this vendor rating scheme, supplier performance in a lean production system can be evaluated by decreased order lead times and low reject rates. Price is no longer be the most important factor, other non-cost criteria such as quality, delivery and other services such as design ability, must now be considered.

2) The Making of a Lean Supply Chain

Whilst for those (applicable to both SMLs and large industries) in their quest to develop a lean supply chain that contains a number of smaller industries/businesses or sub-tiers suppliers, the relevant improvement opportunities and recommendations shall comprise as below:

Suggestions:

- 1) The executives, managers, buyers, field quality personnel, engineers, etc. should have a shared understanding of lean production. Suggest classroom training, followed by site visits to successful lean producers, followed by classroom dialogue, followed by additional site visits to lean producers, etc.
- 2) Resolve systemic supply chain complaints prior to launching a lean initiative.
- 3) Have a clear understanding of how the sub-tier suppliers operate.
- 4) Centralize commodity management to reduce the number of buyer interfaces and avoid sending confusing signals to the supply chain.
- 5) Understand risk in the eyes of small businesses. Distinguish between acceptable stretch goals and unrealistic goals that generate negativity and cynicism.
- 6) Structure continuous improvement activities to the realities of small businesses. D Assign people to work on the project full-time and establish regular dialogue meetings.
- 7) Always co-locate cross-functional lean supply chain teams.
- 8) Be patient - lean production is not a "quick win" initiative. Major changes in mindset and skills take time.

Further to the above mention all the supplier development initiatives that can be adopted to create lean suppliers shall best be summarized in the following framework shown in Figure2.

3) Change of the Mindset

While companies set out on the road to lean, it is always important to lay a foundation layer, which is to focus on the mindset of their employees. Thus, as far as lean transformation is concerned, the employees have to understand its two main cornerstone: i.e. **value added focus** and **sources of waste**. Value is defined by customers but created by producers. Whereas through these value added concepts, sources of waste along the value stream have to be identified and hence eliminated. So, what sort of wastes would company likely to encounter in their daily operation? The answer shall be found in Table A1 (refer to Appendix) which classifies the seven types of waste into three detailed aspects - materials, people and equipment. Waste can be very tremendous and thus it is difficult to eliminate/tackle all wastes at one goal. Thus, this table shall best be used as a guidance tool for SMLs to adopt their lean operation progressively in each of more concerned areas -which usually known as 'island' of lean transformation.

4) Quick Set Up -Setup Time Reduction

Many generic manufacturing processes have to run in batch mode because the setup requires considerable time even when properly organized. The batch size is heavily dependent on the setup time. Poor setup discipline is a major reason for high WIP and poor quality.

5) Built-in Quality System

The quality system here refers to building in quality rather than inspecting quality. To achieve this, SMLs can use:

- Autonomous defect detection mechanism- poka yoke
- Statistical process control – to control processes and not the product
- Visual control tools – Andon lights, Yamazumi boards, etc
- Standardized work and quality procedure – to reduce variation and to ensure for quality conformance

6) Visual Performance Measures and Benchmarking

For any businesses, despite their size, whatever they seek to improve or waste they seek to eliminate, measurement is necessary to know exactly where they are, where they have been and where they are going. Any area for which improvement is sought must be initially measured or in particular, benchmarked to establish a baseline to measure progress. Once an improvement plan has been approved and implemented, data are collected to assess the extent of progress made and to determine what more needs to be done. Thereafter, data is collected and results are announced. The results, in this case, should be posted so that everyone can quickly see progress made and problems remaining. In other words, performance data not only have to be made measurable, but also have to conform to principle of visibility.

7) Leveled production requirements

One of the requirements of lean production is that reasonably level production must be maintained for a month or at least 10 days. This causes many SMLs/potential users to reject implementation because their product demand is perceived to be much more variable than lean production will allow. Usually, further investigation reveals that although product orders show considerable variation, this is primarily due to the use of economic order quantity calculations.

Leveled production enables the purchasing department to request smaller, more frequent shipments from most suppliers. This greatly reduces the parts inventories so they can be located next to the production line, which reduces double handling and the amount of sorting and reshipment necessary if a quality problem occurs with a supplied part. The number of changes in order quantities due to demand changes, which are common in manufacturing resource planning (MRP) systems, is greatly reduced.

Suppliers generally are willing to consider changing their operations to accommodate their customers. Sometimes a problem occurs when the supplier needs to modify the production processes or to start using JIT systems to realize the potential savings because they are not using lean production concepts. Since the supply chain is looked on as

an extension of the plant, it is frequently necessary to encourage suppliers to convert their operations in order to retain the business. In these cases, technical help to get started is sometimes supplied, which greatly accelerates the process. If the supplier is already supplying another plant that is using lean production concepts, the implementation is much easier.

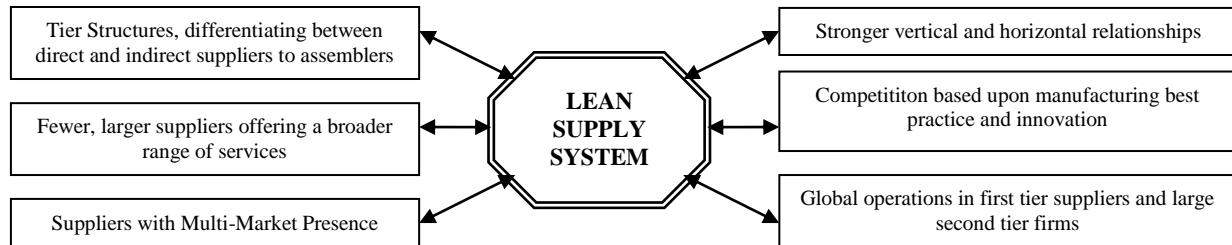


Figure 2: A Proposed Lean Supply Framework

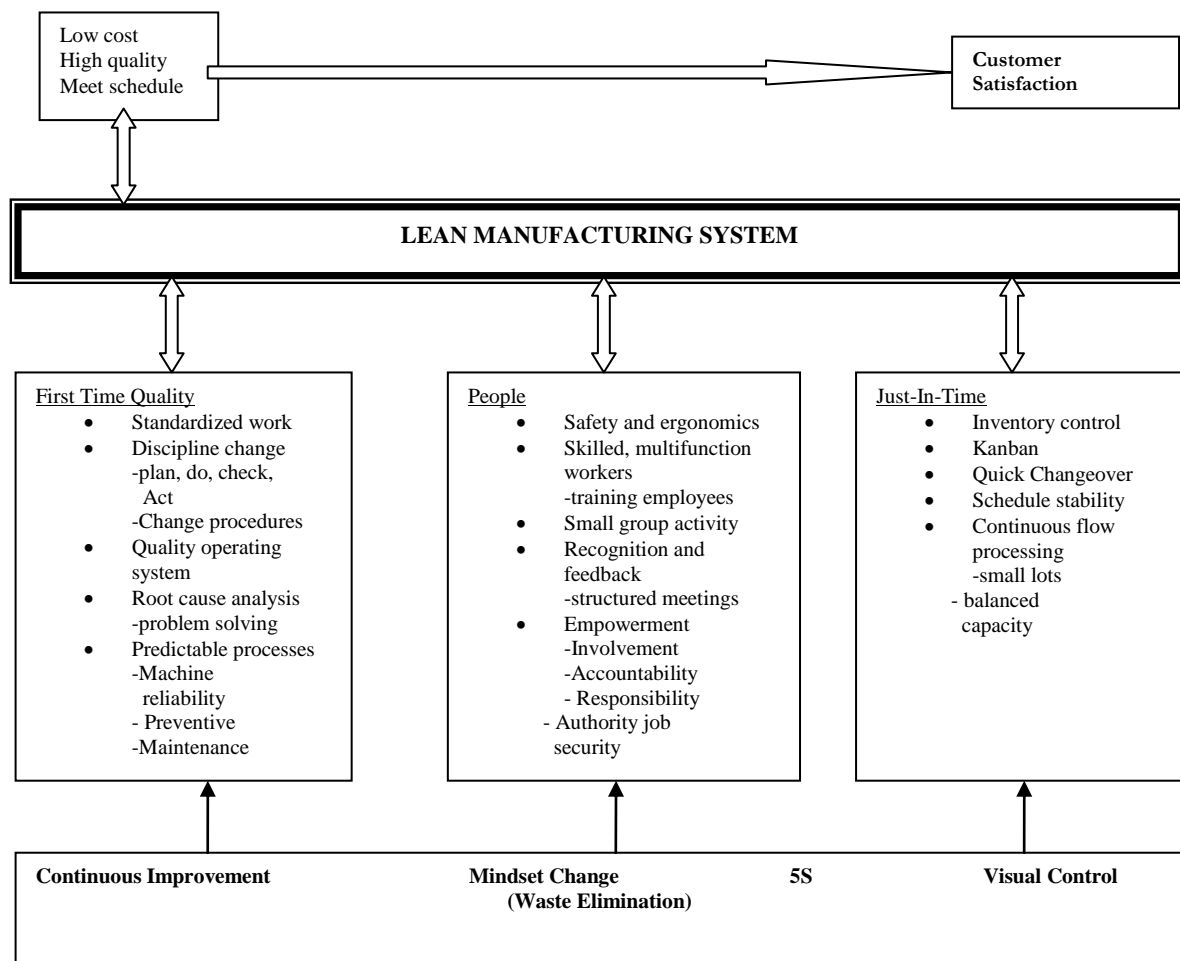


Figure 3: A proposed Framework for Lean Manufacturing System for SMIs

CONCLUSIONS & RECOMMENDATIONS

However, the validity and transferability of the framework which is supposed to function as a generic model for SMIs can be summarized with the following implications:

- Lean manufacturing concepts are applicable to SMIs, but the relevant tools and techniques must be used in order to enable the philosophy needed to be applied with some necessary modifications to be made depending on the nature of the industry.
- Lean manufacturing is not a quick win initiative, therefore, a gradual implementation of lean activities that can match the internal configuration should be adopted.
- Employee empowerment and self-directed work teams should be reinforced to facilitate lean transformation in SMIs via continuous improvement programs.
- SMIs in Malaysia have to be awakened to the benefits of a lean structured approach with the needs to become lean industries at earlier stage; then, train the internal resources to provide the necessary skills and hence making the associated lean techniques more accessible.
- The generic model/framework produced can be treated as a methodology that could be useful for those who are currently developing knowledge (in terms of tools, approaches and practices) on lean production.
- The development of this integrated generic model of lean management for SMIs also shows that links can be established to test the role or to validate the suitable points for adoption of lean concepts in SMIs.
- The model together with the gap analysis framework would also help to address and identify gaps between existing SMI performance and the criteria for lean production and also the important dimensions of the factors influencing SMI performance.
- Future work can also be done by researchers in the field of innovation management for small business support unit. The proposed generic model can be used in the future in a modular fashion, and quantitative measures could also be designated for use with the model. The use of quantitative measures would also allow companies to benchmark against each other.

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